Proceedings of the

SECOND ROTATION PLANTATION ESTABLISHMENT WORKSHOP

Edited by

Charles A. Gresham

Sponsored by

The Belle W. Baruch Foundation

The Baruch Forest Science Institute

International Paper Company

Westvaco Corporation

Hobcaw Barony

Georgetown, South Carolina

February 17,18,19 1987

RE-ESTABLISHMENT OF SAND PINE:

AN EXAMPLE OF HOW THE HARVEST SYSTEM EFFECTS REGENERATION

Kenneth W. Outcalt

INTRODUCTION

Changes in utilization standards and harvesting equipment have resulted in development of more mechanized harvesting systems (Koch and McKenzie, 1976). The short-wood system has been largely replaced by tree-length and full-tree systems with on-site chipping becoming more prevalent. Early in the advent of these more mechanized systems it was recognized that they would effect the regeneration of the subsequent stand much more than the conventional short-wood systems (Zasada, 1975). It was also recognized that these mechanized systems of harvest could have both positive and negative effects on regeneration of the site. Some of the possible advantages identified were increased soil scarification, better competition control, and less residual debris. Possible negative effects included increased soil compaction and nutrient depletion. The forest manager must select a system to take advantage of the benefits while minimizing the possible detrimental aspects of the mechanized harvesting system.

The purpose of this paper is to discuss three mechanized harvesting systems presently in use for sand pine, using them to illustrate how modifications can be incorporated to lessen potential negative impacts while still obtaining the benefit of easier and less costly regeneration.

SAND PINE

Sand pine (*Pinus clausa* (Chapm. ex Engelm.) Vasey ex Sarg.) is native to the droughty, acid, infertile, marine deposited sandhills of Florida and Baldwin County, Alabama. The largest concentration of the Ocala variety (*P. clausa* var. *clausa* D. B. Ward) is in the center of Florida on an area of rolling sandhills known as the Central Highlands. The Choctawhatchee variety (*P. clausa* var. *immuginata* D. B. Ward) is found along the Gulf Coast of northwest Florida from the Apalachicola River westward into Alabama (Little, 1979). Although a minor southern pine, sand pine is quite important in Florida where it is the dominant species on approximately 1.2 million hectares (Eyre, 1980). It also has the potential for converting to pine much of the other 2 million hectares of scrub hardwood dominated sandhills which exist in the Southeastern United States.

The two varieties of sand pine differ considerably in ecology and habitat. The Ocala variety has serotinous cones which persist on the tree for many years storing large quantities of seed. Under natural conditions fire releases these seeds and dense stands of seedlings appear. The Choctawhatchee variety typically has open cones and does not respond favorably to fire. Because it does not prune very well, has fairly crooked stems and is quite limby, compared to most other southern pines, loggers prefer to use mechanized harvesting systems and on-site chipping for sand pine. Following harvest, Choctawhatchee sand pine plantations are typically re-established, as with other southern pines, by planting. Because of its lack of dormancy, survival is generally poor and variable for planted Ocala seedlings (Burns and Hebb, 1972). Therefore, most stands of the Ocala variety are re-established by direct seedling.

HARVESTING SYSTEMS

System one is a full-tree method using feller bunchers to sever the trees very close to the ground and place them in convenient sized piles. The trees in these piles are then taken intact to an on-site chipper by grapple skidders. The entire above-ground portion of the tree is run through the chipper and the chips are collected in vans for transport. This system is being employed to harvest a large portion of the sand pine plantations in the Florida panhandle.

System two, a tree-length system, also uses feller bunchers to cut and accumulate the trees and grapple skidders to transport trees to the landing. Unlike the full-tree system, however, trees are limbed by backing them through limbing gates with the skidders before they are taken to the landing. This limbing is done at a few conveniently located places on the harvest site. Once the tree boles are at the landing they are either loaded for transport in tree-length form or chipped on site and transported in chip vans. This has become the standard mechanized harvesting system for pine in much of Florida.

System three is also a tree-length system using feller bunchers and grapple skidders. Unlike method two, however, trees are piled in windrows rather than individual piles and no limbing gates are used. Limbing is accomplished by driving the skidder over the tree tops in windrows and then trimming the remaining branches with a chainsaw. After limbing, tree boles are skidded to the landing for on-site chipping. The chipper separates the bark from the "clean chips" and puts each into their respective van for transport. This harvest method is being used for Ocala sand pine on the Ocala National Forest.

REGENERATION

System one, the full-tree method, leaves a very clean site because about 95 percent of the branches and 85 percent of the needles are removed from the site. Because the site is clean and the stumps are low, the sites harvested by this system do not need any site preparation and they can be machine planted very easily.

However, the chips are poor quality because the branch material has a high bark to wood ratio and the needles are high in moisture content. In addition, since these sandhills sites are so poor the needles are worth much more as organic matter and a source of nutrients on the site than as a raw material.

System two keeps the low value crown material out of the chips and on the site. This gives higher quality chips and is less likely to lead to future growth declines from depletion of site nutrient reserves. The slash that is left on the area, however, is distributed quite unevenly. Samples were taken following harvest of a 40 hectare typical sand pine stand; age 50, 530 trees/hectare, average diameter 16.75 cm, and average height 12.9 m. Dry weight of slash left on the site was 3,700 kg/ha. This material was concentrated on 30 percent of the site while about 65 percent of the site was essentially free of slash. Based on distribution of biomass in sand pine trees (McNab et al, 1985) and the stand data, we expected about 11,000 kg/ha of crown material in the stand. Some of the crown material was removed as chips as the limbing operation is not 100 percent effective, but a good portion of the material not accounted for remains on the site around 3 landings and in a few large piles where extensive limbing was done. Because of the uneven slash distribution, sites harvested by this method have very uneven site preparation needs. Typically the landings and pile areas are not regenerated as they do not occupy enough of the area to justify the special site preparation treatment needed for regeneration. The nutrients contained in material concentrated in these areas is unavailable for the rest of the site.

System three as with system two, limits the amount of crown material included in the chips. This means higher quality chips and lower nutrient removals than the full-tree system of harvest. Two sand pine stands age 37 and 42, 435 trees/ha, average diameter 17.5cm, and average height 13.1m were sampled following harvesting. The essentially slash free area, at 66 percent, was about the same as for the system using the limbing gates. The total amount of slash left on the general site however, 10,200 kg/ha dry weight, was considerably greater. Based on stand data, we expected about 10,200 kg/ha of crown material in the stands prior to harvest. Thus, virtually all of the crown material was left distributed over the site after harvest. Even though there is more slash left on the general site than with the limbing gate method, this material is distributed much more regularly across the site with very little concentration at the landings. Therefore, the site can be operated much more efficiently when site preparation is applied and landings can be regenerated much more successfully. In fact the normal procedure is to seed sites harvested by this method without site preparation using a Bracke seeder. In addition to the more uniform site preparation needs, the more regular slash distribution also gives better nutrient distribution for the next stand of trees to utilize.

SUMMARY

Mechanized harvesting systems offer opportunities for integrating harvest and regeneration as part of total stand management rather than requiring separate operations. This requires selecting and planning the harvest operation to make regeneration easier, if possible. This is not always simple, as often the easiest regeneration practice is not the best management. For example, the full-tree system discussed above gives sites which are the easiest to regenerate, but it is not the best harvesting system because it gives poor quality raw material and removes too many nutrients. Of the three systems described, the tree-length, windrow system seems best because it yields high quality chips, retains site nutrients and produces a site not overly difficult to regenerate.

LITERATURE CITED

Burns, R. M., and E. A. Hebb. 1972. Site preparation and reforestation of droughty, acid sands. USDA For. Serv. Agric. Handb. 426, 61 pp.

Eyre, F. H., Ed. 1980. Forest cover types of the United States and Canada. Society of American Foresters, Wash., D.C. 148 pp.

Koch, P. and D. W. McKenzie. 1976. Machine to harvest slash, brush, and thinnings for fuel and fiber--a concept. J. For. 74:809-812.

Little, E. L., Jr. 1979. Checklist of United States trees (native and naturalized). Ag. Handb. 541. USDA For. Serv. Wash., D.C. 375 pp.

McNab, W. H., K. W. Outcalt, and R. H. Brendemuehl. 1985. Weight and Volume of plantation-grown Choctawhatchee sand pine. USDA For. Serv. Res. Pap. SE-252, Southeastern For. Exp. Stn. Asheville, NC. 44 pp.

Zasada, Z. A. 1975. Timber harvesting effect on forest and silvicultural practices. In Intensive forest Management Conf. Cloquet Forestry Center, March 1975. Univ. of Minn. Ag. Exp. Stn. Misc. Rep. 136, pp 23-29.